

Piranha MAS-2

Non-invasive Tube Current Probe Adapter for the Piranha

User's Manual - English - Version 1.0B

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Intended Use of the Piranha MAS-2

Together with instruments from RTI Electronics AB it is to be used for independent service and quality control, as well as measurements of kerma, kerma rate, kVp, tube current, exposure time, luminance, and illuminance within limitations stated below.

If installed according to accompanying documents, the product is intended to be used together with all diagnostic X-ray equipment except for:

- therapeutical X-ray sources.
- X-ray equipment with tube potential below 20 kV.
- X-ray equipment on which the instrument cannot be mounted properly, e.g. equipment where the beam field size is narrower than the active part of the detector.
- specific types of X-ray equipment listed in the instructions for use or in additional information from the manufacturer.

With the X-ray installation in stand-by conditions without patients present, the product is intended to be used:

- to provide the operator with information on radiation beam parameters that might influence further steps in an examination but not an ongoing exposure.
- for assessing the performance of the X-ray equipment.
- for evaluation of examination techniques and procedures.
- for service and maintenance measurements.
- for quality control measurements.
- for educational purposes, authority supervision etc.

The product is intended to be used by hospital physicists, X-ray engineers, manufacturer's service teams, and other professionals with similar tasks and competencies. The operator needs a short training to be able to use the product as intended. This training can be achieved either by careful study of the manual, studies of the built-in help function in measurement software or, on request, in a course provided by the manufacturer.

The product is intended to be used inside X-ray rooms ready for clinical use and can safely be left switched on and in any measuring mode in the vicinity of patients.

The product is NOT intended to be used:

- for direct control of diagnostic X-ray equipment performance during irradiation of a patient.
- so that patients or other unqualified persons can change settings of operating parameters during and immediately before and after measurements.

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Note!

For a full description of the Piranha, see the Piranha Reference Manual. That Manual can be found on the Product CD or be downloaded from RTI's website (www.rti.se). The manual is available both as PDF and Browser format. The Browser (HTML) format is recommended for easy searching.

1 INTRODUCTION

1.1 General

The Piranha MAS-2 is an adapter for use together with a stable current clamp probe (the PROVA 15) and the Piranha X-ray multimeter. It provides a non-invasive way to measure tube current (mA) and tube charge (mAs) on X-ray equipment. The current probe is simply clamped on the high voltage lead and is then ready for measurements.

The greatest advantage is that the method is easy to use and that it is safe. Furthermore there is no need to disconnect the high voltage cables to be able to measure tube current.

The Piranha MAS-2 can measure from 10 mA to 4000 mA, when used together with the Piranha. By using *Free-run* or *Timed* update modes the Piranha MAS-2 is able to measure even lower, with an inaccuracy of 1 - 2 mA.

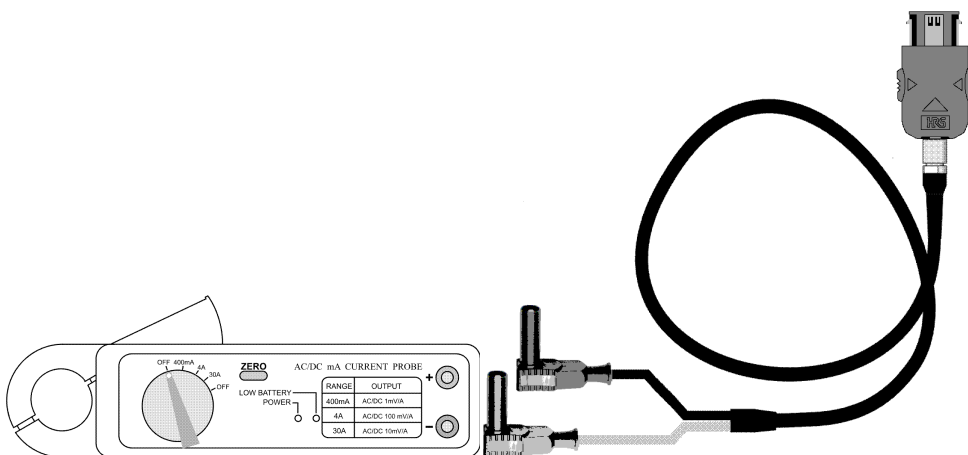
A special calibration, makes it possible to read current and charge directly in mA and mAs in the Piranha QABrowser and oRTlgo display. The mA waveform can also be collected and displayed.

This method is also preferable when adding an absolute mAs reference value for your mAs linearity test.

You can easily transform (by using oRTlgo) your relative output measurement values to absolute mAs values, even for low mAs measurements. A benefit with this method is that you avoid large measurement errors for low mAs values. This is often the case with ordinary mAs meters that are not sensitive to the current waveform.

Using oRTlgo, a certain portion of the mA waveform can be selected using the radiation waveform as reference.

The current clamp probe PROVA 15 is also a general-purpose current meter. The PROVA 15 three-range voltage output can be used together with an oscilloscope or DVM. Currents between 0 - 30 A in the frequency range DC to 1 kHz can be measured.



The PROVA 15 current probe

The Piranha MAS-2 adapter cable

2 FUNCTION AND CONNECTION

The overview of Piranha will be divided into three different main parts:

- **Function:** general overview.
- **Connection:** how to connect the probe and cable.
- **Initial Offset Adjustment:** shows how to do final adjustments before starting to measure.

2.1 Function of the Piranha MAS-2

The Piranha MAS-2 is an adapter for use together with a current clamp probe (the PROVA 15) and the Piranha electrometer.

The PROVA 15 is powered on with the range switch.

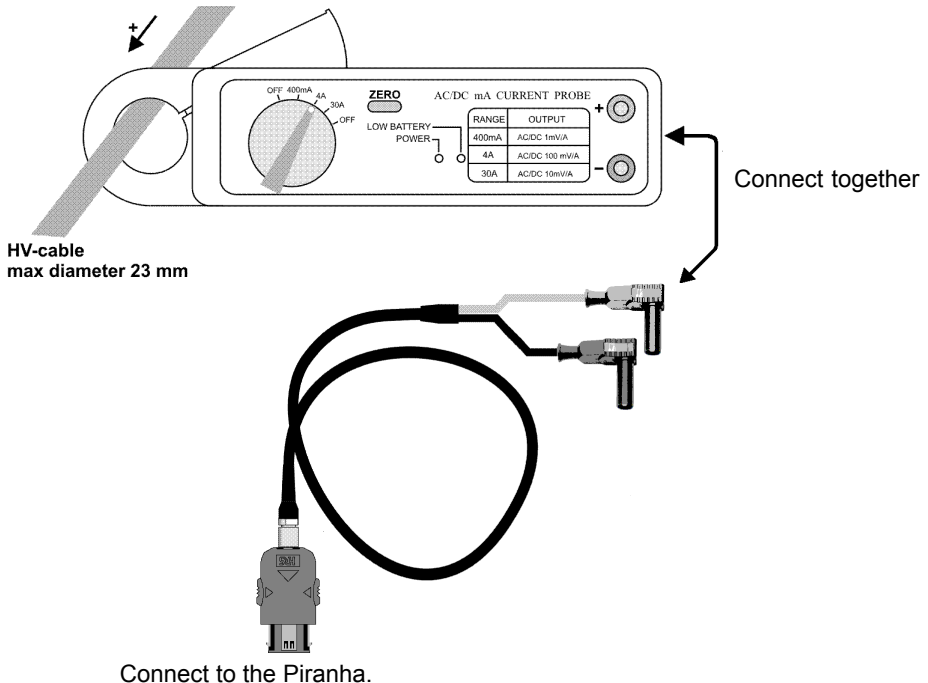
NOTE! The PROVA 15 must be in the 4 A range when used together with the Piranha.

2.2 Connection of the Piranha MAS-2

The Piranha MAS-2 is connected to the detector input of the Piranha using the round Lemo connector.

The PROVA 15 is connected using the two banana connectors in the other end of the cable.

NOTE! Make all connections to the Piranha MAS-2, the Piranha, and the PROVA 15 before powering on the instruments. The PROVA 15 must be in the range 4 A when used together with Piranha. See figure below.



2.3 Initial Offset Adjustment Procedure

Make sure that all instruments are switched off.

Press the jaw trigger and clamp the jaws onto the high voltage cable. Check for correct polarity.

Connect the Piranha MAS-2, the PROVA 15, and the Piranha according to previous figure.

Power on the PROVA 15 (range 4 A), and the Piranha.

Press the ZERO on the PROVA 15 to cancel internal DC offset in the clamp probe.

In the QABrowser, select the appropriate Real-time Meter display, e.g. tap **Measure**, **Radiography**, **Tube Current**, and choose the EMM module to be able to read the current. It is typically shown in the unit "mA".

Tap **Reset**, then "0" should be displayed.

The offset adjustment procedure for Piranha is finished and the Piranha MAS-2 with the PROVA 15 is ready for measurements.

3 MEASUREMENTS

3.1 Measurements of the mAs and mA value

Just perform an exposure and the QABrowser will show you readings of tube current (mA) and tube charge (mAs). You may also study the tube current waveform by tapping the **Wave** button. The Piranha starts to measure when the mA signal is greater than approximately 10 mA when using the Piranha MAS-2. For long exposure times, you may want to switch to the Continuous update mode. The QABrowser will then update the display continuously during the exposure. (See Settings in the Piranha manual).

4 SAFETY PRECAUTIONS

4.1 General Rules

- Do NOT use the Piranha MAS-2 on a circuit with a voltage of higher than 600 V AC.
- Do NOT remove the battery compartment cover when attempting to measure current.
- Do NOT connect the Piranha to an oscilloscope/DVM and simultaneously use the same oscilloscope/DVM connected to the banana terminals of the PROVA 15 probe.
- Do NOT make battery replacement with the Piranha MAS-2 powered ON.
- Do NOT expose the instrument to direct sunlight, extremes of temperature and humidity, or dew fall.
- Do NOT forget to turn the Piranha MAS-2 off after use.

RTI Electronics AB takes no responsibility for misuse of the Piranha MAS-2 or use together with products that the Piranha MAS-2 is not intended for.

RTI Electronics AB assumes no responsibility for customers not following these safety precautions.

5 SPECIFICATIONS

For PROVA 15 specifications see the "PROVA 15 User's Manual"

5.1 General Specifications for Piranha MAS-2

Specifications are valid after a warm-up time of one minute and presuming reference conditions. All specifications together with the PROVA 15 probe unless otherwise stated.

Reference conditions:

Temperature:	+18 °C to +23 °C
Relative humidity:	50 %

Specifications:

Current range Piranha MAS-2 output (Using 4 A range):	10 - 4000 mA
Inaccuracy:	±3 % at 250 mA ±5 % or ±2 mA between 10 - 4000 mA
Scale factor (Piranha MAS-2 output):	1 nA/mA (±0,1 %)
Maximum diameter of high voltage cable:	Appr. 23 mm
Cable length:	150 cm
Weight:	< 0,2 kg
Operating temperature and relative humidity:	15 - 30 °C at <80 % relative humidity
Storage temperature:	-10 °C to +50 °C
Battery life for PROVA 15:	Appr. one year of use or 40 hours
Battery type for PROVA 15:	2 alkaline IEC R6 (size AA) 1,5 V batteries

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